BROADCAST tools INC

Installation and Operation Manual

16 x 2 (SS 16.2)

Sixteen Input, Dual Output Stereo Switcher/Router

Firmware Version v 1.08

Manual Update: 7/1/2004

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INTRODUCTION

Thank you for your purchase of a Broadcast Tools, Inc., 16 x 2, Sixteen Input, Dual Output Stereo Switcher/Router that we will refer to throughout the manual as the 16 x 2. We're confident this product will give you many years of dependable service. This manual is intended to give you all the information needed to install and operate the unit.

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Only qualified personnel should install Broadcast Tools® products. Incorrect or inappropriate use and/or installation could result in a hazardous condition.

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If you have any questions regarding your product or you need assistance, please contact your distributor from whom you purchased this equipment.

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NOTE:

This manual should be read thoroughly before installation and operation.

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PRODUCT DESCRIPTION

The 16x2, sixteen input, dual output stereo switcher/router passively switches or routes any one of 16 stereo inputs to either or both stereo outputs or vise-versa through gold contact relays. The passive nature of the switching allows for any input level and impedance to be used. Inputs may be balanced or unbalanced, while output levels, impedance, distortion, noise and balancing will match that of the selected input. In addition to their normal use with audio signals, the 16x2 can also be used to switch digital signals and telephone lines. Control is via front panel switches, contact closures, open collector status and/or multi-drop RS-232 port. Removable screw terminals are provided for all audio connections.

The 16 x 2 has several unique features. The Power-Up feature allows the user to select which of any source is active at power up, including the last source selected. Audio mute allows the user to turn off either or both audio outputs when activated. The Enable switch provides a safety lock to the front panel source selection switches. Dual Audio Activity Monitor LED's with remote status monitor the output audio from either or both outputs. A Serial Port allows communication and operation from a host computer's serial port. 16 "PIP" TTL/CMOS compatible inputs and open collector GPI ports allows the serial port monitoring of contact closures from satellite receivers; tone decoders; etc; while the open collectors provide a means of controlling devices with commands from a host computer's serial port. Source number one is configured by default to route audio to both outputs in the case of loss of power to the unit. Non-selected sources are terminated with 100K Ω, load resistors.

APPLICATIONS

Some of the applications of the 16 x 2 include: Studio selection and routing; Audio processing selection; Exciter input selection; Remote broadcast input selection; STL source selection; Automation source selection; EAS audio switching; ISDN or Phone hybrid feed selection; IFB selection; Satellite audio channel switching and console monitor inputs and outputs selection.

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FRONT PANEL DESCRIPTION

SOURCE SWITCHES

Each switch represents an input to be routed to either or both of the outputs. High quality tactile switches will give the user years of dependable service. Each switch has an associated LED indicator, which will illuminate when that particular source is routed to either or both of the outputs. When a source is selected, the previous source will be deselected, (interlocked). The ENABLE switch, when enabled, must be pressed and held in order for any of the source switches to function. This function may be bypassed. The front panel is also equipped with a MUTE switch. This switch, when pressed in combination with the OP 2 and/or ENABLE switch, turns off the output.

LEDS

LED indicators, which will illuminate when the desired channel is selected to output one, slowly flash when to only output two and rapidly flash when to assigned to both outputs. The Pwr/Ser LED displays valid power and serial data activity. The mute LED denotes when audio is off. The respective activity LED's light when audio is present at the appropriate output.

REAR PANEL DESCRIPTION

The rear panel contains all input, output and remote control interfacing connectors. Audio inputs and outputs are routed through pluggable screw terminals. Remote control is accomplished via a 37 pin "D" connector. A modular jack is provided for the multi-drop serial port.

POWER

Connect the 2.1mm coaxial type power connector into the unit and the 9 VAC @ 500 ma wall transformer into a 120 Vac 50-60 Hz power source. The front panel power LED indicates when power is applied to the unit. (220 Vac 50-60 Hz wall transformer OPTIONAL)

AUDIO SIGNAL CONNECTOR

The 16 x 2 is supplied with Pluggable Screw terminals (Euro) and Mating connectors. Channel and polarity designators can be found on the left side of the printed circuit board, as viewed from the rear.

"REMOTE" J3, CONNECTOR

The male 37 pin "D" connector is provided for connection to equipment, which will remotely control the 16 x 2. Momentary contact closure to ground or active low logic will satisfy all input functions.

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INSTALLATION

Installation of the 16 x 2 in high RF environments should be performed with care. Shielded cable is suggested for all control, audio inputs and outputs. All shields should be tied to the EGND terminals. The station ground should be connected to the chassis ground screw located on the far right side of the 16 x 2 as viewed from the rear. It is recommended that all cables connected to the 16 x 2 be looped through ferrite cores to suppress RF. Surge protection with RF filtering such as the Tripp Lite "ISOBAR 4 or 6" is also suggested for the wall transformer. The purchase of an inexpensive UPS will provide back up in case of power outages.

The 16 x 2 is simple to install. The signal inputs, outputs are connected via pluggable screw terminals. Installation of the 16 x 2 consists of six steps:

1. Inspection
2. Removal of the source termination resistors, if applicable
3. Bench test and option set-up
4. Mount the unit in a rack or desktop
5. Connect your equipment to the unit
6. Label the front panel switches
7. Serial operation, if applicable

STEP 1: INSPECTION

Please examine your 16 x 2 carefully for any damage that may have been sustained during shipping. If any is noted, please notify the shipper immediately. Retain the packaging for inspection by the shipper. The package should contain the 16 x 2, this manual, 37 pin female D-connector/shell, 7 foot modular cable, 9 VAC @ 500 ma transformer, modular cable, 9-pin D-Sub adapter and audio mating connectors.

STEP 2: SOURCE TERMINATION RESISTOR REMOVAL

Input sources that are not selected are terminated with a 100K Ω. If you do not want this load applied across the deselected sources, it may be removed from each channel. Each channel has a pair of resistors.

• **EXAMPLE:** Channel 1, relays K1 A&B switches the signal; R15 & R21 are the load resistors. As delivered, all channels are configured with these resistors installed. To remove the load resistors from a channel, locate via the schematic the proper resistors for that channel, cut its leads and discard the resistors.

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INSTALLATION *Continued*

STEP 3: BENCH TEST and OPTIONS

Place each unit on a workspace and connect power to the unit. Check to see if LED #1 (Switch 1) and the Pwr/Ser LED are lit (Source one is the power-up factory default). Connect an audio source to stereo input one and a monitoring device to the output(s). Verify that audio is present at both outputs. Repeat the process until each channel's operation has been verified.

OPTIONS

JP2 To enable the front panel "**ENABLE**" switch, place a jumper over JP2. The **Enable** switch is disabled at the factory.

DIP Switches

DIP (SW-2) Switch Functions

Unit ID	SW2-1	SW2-2
ID 0 *	**OFF**	**OFF**
ID 1	ON	OFF
ID 2	OFF	ON
ID 3	ON	ON

3 OFF = Normal operations (Default)
3 ON = Front Panel programming. Use the front panel switches and LED's.
4 = Not used

Pressing a button selects the option and stores it. The LED shows the state of the option. When finished, initial channel settings can be selected by pressing button 16, at which point the channel 16 LED stops flashing. Then using the front panel like normal will have the same effects as normal, but will record those settings as the startup settings. To exit this mode, turn off the unit, turn off Switch 3, then turn the unit back on.

1 = 1200 Baud
2 = 2400 Baud
3 = 4800 Baud
4 = 9600 Baud **Default**
5 = 19200 Baud
6 = 38400 Baud
7 = OFF = Open collectors follow inputs (Latch) Default
ON = Open collector pulse for 1 sec
8 = OFF = Open collectors follow switch 7 rules **Default**
ON = Open collectors are software controlled.
9 = Set external inputs to act like front panel switches
10 = Set PIP Mode: Follow Inputs
11 = Set PIP Mode: stretch positive pulses to minimum 1/2 second

NOTE:

When the unit is in "Programming" mode, the "Channel 16" and "Power" LED's flash rapidly. The current settings are displayed on their respective LED's.

! TIP

The "ACT" LED's are also an audio output indicator.

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INSTALLATION *Continued*

12 = Set PIP Mode: stretch positive pulses to minimum 1 second
13 = Set PIP Mode: stretch positive pulses to minimum of 2 seconds
14 = Set PIP Mode: stretch positive pulses to minimum of 4 second
15 = OFF = Allows selection of power up channel. Select after out of programming mode. **Default**
ON = Selects "Last Source Selected"
16 = OFF (initial state) – switches 1-15 behave as above
Power LED Blinking – (final state) – input switches behave as if 3 were off, but are recorded.

The 16x2 is a passive switcher. Any one of the 16 inputs may be assigned to either or both outputs, but inputs can never be mixed.

1 To assign an input to output 1, press any one of the 16 input switches. The associated LED will light.

2 To assign an input to output 2, press and hold the "OP 2" switch, then press the desired input switch. The associated LED will flash slowly.

3 To select an input to both outputs, press the desired input switch, then press and hold the "OP 2" switch followed by pressing the same input switch once again. The associated LED will flash rapidly.

4 To mute any input routed to output 1, press the MUTE switch. NOTE: If both outputs are muted, the mute LED will flash.

5 To mute any input routed to output 2, press and hold the MUTE switch; then press the "OP 2" switch. NOTE: If both outputs are muted, the mute LED will flash.

6 To mute both outputs, press the MUTE switch, then press and hold the "OP 2" switch, and then press the MUTE switch. The mute LED will flash.

The Power Led is designed to light when power is valid. Its second job is to indicate when serial data is sent or received. The third is to flash when the 16x2 is in the "Programming" mode.

Serial Control

Pin out of the modular/D-Sub adapter is shown below.

RJ-11 Adapter. Pin Number.	DB-9 Female. Pin Number.	Product's point of view Function Name.
4	3	RS-232 Receive
3	2	RS-232 Transmit
2	5	Ground

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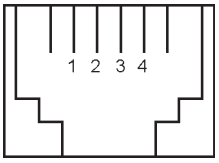
INSTALLATION *Continued*



Modular connectors point of view.

Serial Burst Mode Commands

The unit is controlled via the Burst mode. The baud rates are selected on page 6. The 16 x 2 may be serially controlled via the multi-drop RS-232 port. Commands may be entered with a short form code (burst mode). All commands and responses use normal ASCII characters, facilitating scripting. A burst mode command starts with an asterisk ("*") followed by the device (ID) address as a single decimal digit. The device (ID) address (0-3) is specified on the on-board DIP switches. A burst mode command must be entered within 5 seconds, or it will time out. No carriage-return or line-feed is required to terminate the command except for those few commands of variable length, if the maximum length is not sent. If the command requests a response, the response will consist of an upper case "S", followed by the unit address, and then the specific response. If acknowledgements are enabled, successful commands are responded to with "RRR", while errors get an "EEE" response. The syntax of each command is given below. The syntax shows the command exactly as it should be sent, *except that lower case characters represent values that should be substituted.*

Glossary Of Command Notation

Character String	Meaning	Allowable Values
U	Unit ID	0-7
Ii	Input Number	01-16
O	Output Number	1 – 2 – A (ALL)
Rr	Open Collectors	01-16

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Audio Switch Control Commands

*uiio	- Apply input "ii" to output "o"
*uiiA	- Apply input "ii" to both outputs
*uiiMA	- Mute input "ii" for all outputs
*uMo	- Mute output "o"
*uMA	- Mute all outputs

Serial string example: ***1162** Address for unit 1, with input sixteen routed to output two.

Output Collector Commands

*uORrrL	- Latch open collector "rr"
*uORrrF	- Unlatch open collector "rr"
*uORrrP	- Pulse open collector "rr"

Miscellaneous Retrieval Commands

*POLL - Respond with unit (ID) address in appropriate time slot. If there are multiple units on the line, each will respond with a different delay after receipt of this command.

*uB1 - Turn on burst mode responses. A valid command will result in response of "RRR". Error will result in response of "EEE".

*uB0 - Turn off burst mode responses (default)

*uSL - Send Audio Status:
SuLo,x,x,x,x,x,x,x,x,x,x,x,x,x,x,x,x<CR><LF>. "u" is unit ID, "o" is output, and "x" is "1" for connected; "0" for not connected for each respective input.
Thus "S1L2 ,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0<CR><LF> says that unit 1, output 2 is connected to input 1.

*uSPii - Send (**PIP**) status of programmable pulse stretcher input "ii". Response is "SuP,ii,x" where "x" is 1 if the corresponding input is high, 0 otherwise.

*uSPA - Send (**PIP**) status of all programmable pulse stretcher inputs. Response is "SuP,A,x,x,x,x,x,x,x,x,x,x,x,x,x,x,x,x<CR><LF > where input 0 is first and input 15 is last. "x" is 1 if the corresponding input is high, 0 otherwise.

*uSR - Send status of all open collectors. Response is:
SuA,x,x,x,x,x,x,x,x,x,x,x,x,x,x,x,x <CR><LF>

*uU - Send Unit Information:<name(16.2)><version(1.08)><cr><lf

NOTE:

When the ID is set to 0 and the switcher is configured for PIP, any time a front panel switch is pressed, audio status is transmitted. ***Any ID other than 0 requires the unit to be polled.***

NOTE:

When the ID is set to 0 and the switcher is configured for PIP, any time a PIP input changes, PIP status is transmitted.

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STEP 4: MOUNTING

Mount the unit in a rack or desktop, allowing adequate airflow for cooling.

STEP 5: CONNECT YOUR EQUIPMENT

The 16 x 2 interfaces to your equipment (sources and loads) through the rear panel pluggable screw terminals. Follow the legends for the desired audio input and output connections, which appear on the rear side of the printed circuit board and also on the layout drawing on the last page of this manual. Remove each screw terminal, strip each conductor and insert the conductor into the terminal and screw down the capture screw. The terminals accommodate wire sizes from 16 - 28 AWG solid or stranded wire.

STEP 6: DESIGNATION STRIP

The designation strip is provided in order to write the source descriptions under each source switch.

STEP 7: SERIAL OPERATION

The supplied modular cable and 9 pin D-sub adapter may be connected to the 16 x 2's rear panel modular connector. Plug in the D-sub adapter into your computer's serial port. Plug the supplied wall transformer into a source of 117 vac and the cable end of the transformer into the power receptacle on the 16 x 2. The protocol is as follows: 1200, 2400, 4800, 9600, 19200, 38400, 8N1. Flow Control should be NONE, emulation ANSI and the mode should be DIRECT TO COMx (x = the available com port). **The default is 9600,8,N,1.**

Serial string example: ***1162** Address for unit 1, with input sixteen routed to output two.

REMOTE CONTROL CONNECTOR PINOUTS

J3 Remote Switch Pin numbers:

1 – Switch number **1**
2 – Switch number **2**
3 – Switch number **3**
4 – Switch number **4**
5 – Switch number **5**
6 – Switch number **6**
7 – Switch number **7**
8 – Switch number **8**
9 – Switch number **9**
10 – Switch number **10**
11 – Switch number **11**
12 – Switch number **12**
13 – Switch number **13**
14 – Switch number **14**
15 – Switch number **15**
16 – Switch number **16**
17 – Mute input
18 – Output 2 select
37 – **Ground**

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STATUS

The status signals from the front panel indicator LEDs are supplied through the "REMOTE" control connector as individual open collectors. This may provide status to a remote control point to indicate which source is selected. The status output for the selected output will go low, providing a return for an LED indicator or TTL/CMOS logic. External pull-up resistors may be required in some installations.

J3 "REMOTE" Status pin numbers (Open Collectors):

19 – Audio Activity LED/Open collector for output **1**
20 – Status number **1** 21 – Status number **2**
22 – Status number **3** 23 – Status number **4**
24 – Status number **5** 25 – Status number **6**
26 – Status number **7** 27 – Status number **8**
28 – Status number **9** 29 – Status number **10**
30 – Status number **11** 31 – Status number **12**
32 – Status number **13** 33 – Status number **14**
34 – Status number **15** 35 – Status number **16**
36 – **Audio Activity LED/Open collector for output 2**

SPECIFICATIONS

INPUTS/OUTPUTS:	Any input level and impedance can be used. Inputs may be balanced or unbalanced. Output levels, impedance, distortion, noise and balancing will match that of the selected input.
SWITCHING METHOD:	*Passive*. Sealed relays utilizing 2-form-C Bifurcated-Crossbar silver alloy with gold overlay contacts.
LOGIC:	Flash Microprocessor, non-volatile memory.
OPERATION CONTROL:	*Front Panel* - Momentary switches. *Remote* - Momentary closure to ground or 5 Volt TTL/CMOS Logic levels. *Serial* - RS-232c, 6P4C modular w/ 9 pin-D-Sub adapter, 1200, 2400, 4800, 9600, 19200, 38400 / 8,N,1
STATUS:	*Front Panel* - Indicator LED in Switch. *Remote "Act" LED's* –Trip level set at –35db below Ref. *Remote* - Open collector outputs, limit current to 50ma per output. Pull-ups may be required.

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INTERFACING:	*Audio* - Pluggable screw terminals (Euro). *Remote Control* - Male 37 pin "D" connector. *RS-232* - 4C6P Modular. All mating connectors, modular cable and adapter supplied.
POWER REQUIREMENTS:	9 Vac, 500 ma. 120 Vac 50-60 hz transformer.
PHYSICAL DIMENSIONS:	19" X 1.75" X 4.5" (WHD)
WEIGHT:	5.0 lb.

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